

CLAIMS

1.- A process for the manufacture of nuclear fuel pellets through the sintering of a material containing uranium dioxide UO_2 obtained from a powder originating from a process for the conversion of uranium
5 hexafluoride UF_6 , characterised in that the powder obtained directly by a UF_6 hexafluoride conversion process is placed in a vessel containing moving compression and mixing bodies and in that the vessel is agitated in such a way that the powder moves within the volume of the vessel in three non-coplanar axes in such a way as to be compressed between the moving
10 bodies and between the moving bodies and the walls of the vessel to form a particulate material having a density in the uncompacted state of at least 1.7 g/cm^3 , and that the particulate material obtained by agitation in the vessel is used to shape raw fuel pellets which undergo sintering.

2.- A process according to claim 1, characterised in that the vessel is
15 subjected to three-dimensional vibratory movement.

3.- A process according to either of claims 1 and 2, characterised in that the powder placed in the vessel is obtained by a dry route conversion process and has a density of less than 1 g/cm^3 and that the density of the particulate material obtained by agitation in the vessel is approximately
20 2 g/cm^3 in the uncompacted state.

4.- A process according to any one of claims 1 to 3, characterised in that the powder obtained directly by a UF_6 hexafluoride conversion process has a density of less than 1 g/cm^3 and a flowability of zero as defined by a standard test of passage through a 15 mm orifice, and in that the particulate
25 material obtained by agitation in the vessel has a flowability of more than 10 g/s after a few minutes agitation in the vessel.

5.- A process according to any one of claims 1 to 4, characterised in that the vessel containing the moving bodies and the powder obtained by a UF_6 hexafluoride conversion process is agitated for a time of between 1 and
30 600 minutes.

6.- A process according to any one of claims 1 to 5, characterised in that the moving compression and mixing bodies in the vessel are free bodies having any simple geometrical shape and a surface of low roughness.

7.- A process according to claim 6, characterised in that the moving bodies are of cylindrical shape.

8.- A process according to claim 6, characterised in that the moving bodies have the shape of substantially spherical beads.

5 9.- A process according to any one of claims 1 to 8, characterised in that the moving bodies are of one of the following materials: sintered alumina Al_2O_3 , sintered uranium oxide, pure or doped sintered zirconium oxide, tungsten carbide, steels, uranium metal or uranium/titanium alloy.

10 10.- A process according to any one of claims 1 to 9, characterised in that before the vessel is agitated at least one additive comprising at least one pore-forming agent in a proportion equal to at least 0.01% is added to the vessel together with the uranium dioxide UO_2 powder obtained directly by a UF_6 hexafluoride conversion process.

15 11.- A process according to any one of claims 1 to 10, characterised in that at least one additive is added to the vessel together with the uranium dioxide UO_2 powder obtained directly by a UF_6 hexafluoride conversion process.

20 12.- A process according to claim 11, characterised in that the additive is placed in the vessel before carrying out the treatment through agitation of the vessel.

13.- A process according to claim 12, characterised in that the additive is placed in the vessel in the course of the treatment by agitation of the vessel.

25 14.- A process according to any one of claims 11 to 13, characterised in that the additive comprises at least one of the following substances: uranium oxide U_3O_8 , uranium oxide U_3O_7 , plutonium oxide PuO_2 , thorium oxide ThO_2 , gadolinium oxide Gd_2O_3 , pore-forming substance, lubricant, sintering doping agents.

30 15.- A process according to any one of claims 1 to 14, for the production of mixed uranium oxide - plutonium oxide (MOX) fuel pellets, characterised in that the vessel is placed in a confinement enclosure such as a glove box and that the uranium oxide, plutonium oxide powders and

additives are placed in the vessel and that the vessel is agitated in a manner which is controlled from outside the containment enclosure.

5 16.- A process according to any one of claims 1 to 15, characterised in that prior to shaping of the raw pellets by compression of the particulate material obtained by agitation in the vessel, a lubricant material is added to the particulate material and a soft mixture of the particulate material and the lubricating material is prepared in order to distribute the lubricating material over the particles of the particulate material.

10 17.- A process according to any one of claims 1 to 16, characterised in that the particulate material comprising mainly uranium oxide UO_2 obtained by agitation of the conversion powder in the presence of moving bodies is mixed with the plutonium oxide powder PuO_2 before shaping of the raw pellets for the production of MOX fuel.